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# THE GERMAN RUBBER POSITION

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# THE GERMAN RUBBER POSITION

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# THE GERMAN RUBBER POSITION

## I. Introduction

In 1938 the whole area now controlled by Germany consumed approximately 300,000 metric tons of rubber. Of that amount Germany, rearming rapidly, is estimated to have consumed 75-90,000 tons. At the present time Germany is in almost absolute control of all rubber stocks, synthetic production, and imports, throughout the Continent. In 1941 she successfully met a total consumption, for all purposes, of what is estimated to have been 155-200,000 tons. An overwhelming proportion of this amount went to the German military machine; and in consequence rubber was in drastic shortage in all civilian uses. There is, however, no conclusive evidence thus far that the scale or efficiency of German military operations has been impaired by a qualitative or quantitative rubber deficiency. But barring a commercial juncture with the Japanese at some Axis port in the West, it appears likely that the German rubber position will deteriorate in the course of 1942, with Buna and reclaimed natural rubber as the only major sources available.

## II. The Pre-War Position

The first useful amounts of synthetic rubber were produced by Germany in the first World War. It was a complex,

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chemically-produced methyl rubber.[1] Desiring to conserve its foreign exchange, and perhaps to end its dependence on imports, the German chemical industry continued to develop synthetic rubber in the twenties. I. G. Farbenindustrie placed on the market a synthetic rubber called "Buna", of which there are at least two basic types. Despite Germany's advance in the manufacture of special superior synthetic rubber (Buna-N) and ordinary substitute rubber (Buna-S), she remained, on the whole dependent on imports and the British-Dutch monopoly that has controlled rubber production and prices.

As in the case of other strategic materials Germany prepared for war, in the period 1933-39, by creating a stock-pile, constructing synthetic plants, and limiting civilian uses. A tax of 100% was imposed on crude rubber imports to finance research and plant construction for synthetic rubber; and this tax was passed along to the civilian consumers. From an early stage in the rearmament program, the total German rubber supply was rigidly allocated by central authority. It is estimated that a crude rubber stock-pile of 65,000 tons was built up by the outbreak of war, while synthetic production was raised slowly to 25,000 tons, in 1939. A considerable amount of crude rubber scrap was also accumulated, and reclaim capacity was expanded to 35-40,000 tons.

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1. "Synthetic Rubber" by Frank A. Howard, Harvard Business Review, Autumn, 1941, p. 3.

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Upon the outbreak of war gasoline was virtually denied to all civilian consumers. This large scale immobilization of civilian cars made the sale of tires to the government easy to negotiate. A large supply of used tires, for scrap or transfer to light military vehicles, was thus acquired. In the last half of 1941 forced sales of redundant civilian tires were instituted under the pressure of the high rate of rubber consumption induced by the Russian War.

The German rubber supply in the years before the war is roughly summarized in the following statistics (in long tons):[1]

| | Crude Imports | Synthetic Production | Net Scrap Imports |
|---|---|---|---|
| 1922-26 (annual average) | 24,980 | | |
| 1927-31 " " | 42,200 | | |
| 1932 " " | 45,000 | | |
| 1933 " " | 54,100 | | |
| 1934 " " | 59,300 | less than 10 | |
| 1935 " " | 62,900 | less than 100 | 17,211 |
| 1936 " " | 71,800 | less than 1500 | 22,764 |
| 1937 | 98,200 | app. 4,000 | 89,946 |
| 1938 | 90,200 | app. 10,000 | 36,000 |
| 1939 (January-July) | 56,591 | | |

The goal of the German synthetic production program, at its inception, was believed to have been an annual production of 75,000 tons. Production is now estimated, at a minimum, to be

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1. Crude rubber imports from Statistical Bulletin of the International Rubber Regulation Committee, January 1941, p. 13; net scrap imports from Industrial Reference Service Bulletin, Part 10, Rubber and its Products, E. G. Holt (Dept. of Commerce); synthetic production figures, 1934-39, represent judgments of various private informants.

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60-70,000 tons,[1] with 100-110,000 tons in prospect for 1942.

III. Synthetic Rubber

The development of an adequate synthetic rubber was a slow and painful process in Germany. As late as 1938 German manufacturers were complaining of its inadequacy. It was difficult and expensive to work; the quality of the raw material varied markedly, in different batches; difficulties were experienced in joining the crude rubber carcass to the Buna tread and side-walls; and on heavy vehicles Buna tires tended to overheat and catch fire. It was at Hitler's express command that work on Buna continued, and a large scale industry was developed.

It is now believed that German technicians have conquered the basic difficulties previously associated with the use of Buna in the manufacture of tires. The most important of these was in the tire carcass, where natural rubber was believed indispensable for an efficient tire to be employed on heavy vehicles. That problem appears to have been solved, although natural rubber probably remains superior. Rayon, woven like cotton, now serves as carcass fabric, lightening the total weight of the tire and resisting friction-heat better than cotton; while a spray of natural liquid rubber is successfully employed to bind the carcass to side-walls and

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1. "Summary of Enemy Economic Developments", B.M.E.W., No. 95, August 7, 1941, #183. An annual production of 63,000 tons was reported by the Military Attache at London on Dec. 8, 1941.

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tread. The addition of oxygen to the Buna solution is also stated to increase its plasticity and ease of handling.

The only important difficulty which may still persist is in the reclaiming of Buna rubber. Mr. M. A. Marquette, who managed the Engelbert tire plant at Aachen until April 1940, and remained in close touch with its operations for nine months thereafter, states that Buna, when reclaimed, tends to disintegrate into a substance like tar, or pitch; and even when new/or reclaim is added, the material can only be used on bicycle tires, of short life ("six or eight weeks"). If this problem remains, and Buna tires cannot be successfully reclaimed, the German rubber position will be seriously affected, since an increased reliance is being placed on Buna, as opposed to imports and stock-piles of natural rubber.1

In general,however, the Germans have managed to solve, in diverse fields, similar technological problems. They can now manufacture a completely synthetic tire of somehat greater durability than those made from natural rubber; and one expert states that a tire made completely from natural reclaim is feasible. Present evidence would, therefore, indicate a high degree of flexibility in making use of the various types of rubber available.

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1. Opinion on this point differs. Mr. Holt (op.cit. p. 3) states that Buna after separation from natural scrap has been successfully reclaimed.

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There are three kinds of German synthetic rubber:

(a) Butadiene polymerized with sodium, known as Buna K-85,
(b) Butadiene polymerized with acrylonitrile, known as Perbunan N, and
(c) Butadiene polymerized with styrene (25%) known as Buna S.

Type K-85 has been used little. The major material for tires is Buna S; while Perbunan N is used for oil-resistant gasoline hose, gaskets, and other items requiring high resistance to solvent action. Mr. Marquette asserts that Buna N is used as the basic materials in synthetic tire carcasses, although his view is unsupported by other evidence. There is general agreement that the synthetic rubber industry has concentrated on Buna S.

This material was developed at the I. G. Farbenindustrie laboratories located at Leverkusen, where a pilot plant was constructed. Other such small plants were set up at Hoechst (near Frankfort) and Ludwigshaven, although they are believed to have been principally concerned with the development of polyvinol and other plastics, capable of substitution for hard rubber and copper tubing. After plans were made for the large scale manufacture of Buna S, the pilot plant at Leverkusen was expanded to a capacity of about 5,000 tons annually.

The first major plant, however, was located at Schkopau, near Halle and not far from Leuna, where a large

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I. G. unit manufactures synthetic petroleum. It went into operation early in 1939 and produced at a rate of about 25,000 tons a year. The process employed involved the derivation of butadiene from carbide, through a carbon acetylene process. This plant has probably been expanded to 40,000 tons annually, with the gases piped from Leuna (synthetic petroleum plant) furnishing an important element in the raw material. The use of petroleum gases requires a different and more recently developed process, employing mercury arcs. This latter method is believed to be in operation at the second major unit known to be producing butadiene, located at Huls, in Westphalia. Output here is estimated at 25,000 tons annually.

A variety of independent estimates place total German synthetic production for 1941 at between 60,000 and 70,000 tons. This figure is indicated by the output of the Schkopau and Huls plants, plus the production of the expanded pilot plant at Leverkusen. On December 30, 1941 the British reported that the Huls plant had been successfully bombed; and there is an additional report of an explosion at Schkopau, in the "middle of 1940". On the other hand two further units of 20-25,000 tons are known to have been planned, one near Frankfurt on the Oder, the other between

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Minden and Nienburg on the Weser, not far from Bremen. There is no positive evidence that such plants are now in operation, although the British Ministry of Economic Warfare calculates that their output may have to be counted into German supplies in the course of 1942.

Plants on this scale would require about one year to construct, assuming no important delays in the delivery of materials and equipment. They involve large amounts of high grade steel turbo compressors, and mercury arcs. It is likely that the Germans decided to proceed with their construction some time late in 1940, when it became apparent that Britain would not capitulate and when, in all probability, the campaign against Russia was definitely planned. Germany, from the outbreak of war in 1939, had been receiving important quantities of crude rubber/across the Trans-Siberian railway. The prospect of an extended war, and the closing, to Germany of this route from the Far East must have made additional synthetic rubber plants imperative. It seems reasonable that such plants will come into operation in the course of the present year, raising synthetic capacity to about 110,000 tons annually.

The Germans have apparently not exploited the Polish synthetic rubber plant which used a relatively simple process for manufacturing butadiene, from potato alcohol.

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This unit produced about 1500 tons annually, by the same method employed on a large scale in Russia. It involves only three stages of manufacture, as opposed to five in the German process; and ordinary steels can be used since no very high temperatures are developed. The Germans have not employed this process on a large scale, probably because they can not afford to use their supplies of potatoes, sugar, grain, or wood in the manufacture of the requisite alcohol.

The Italian firm of Pirelli for some time had planned to manufacture butadiene from grape alcohol, regarding its process as superior to that of the Germans, in 1938. Subsequent improvements in Buna S have, however, persuaded them to use the German method and possibly two plants are believed awaiting machinery from Germany before beginning operations: one at Terni (capacity 6,000 tons) the other at Ferrara (10,000 tons). Neither is yet regarded as having contributed to the total Axis rubber supply, and for 1941 at least Italy must be listed as a deficit area, with respect to rubber.

The manufacture of synthetic rubber is extremely expensive of electric power: German technicians refer to the plants as "power hogs". For that reason the location of plants in Italy, near cheap sources of hydro-electric power,

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would be a clear advantage. So far as the raw materials are concerned, it is believed that ten tons of coal or three tons of alcohol are required to produce one ton of synthetic rubber, depending on the method adopted.

IV. German Tire Manufacture

In the years immediately preceding the war, German tire production is believed to have absorbed about two-thirds of the total rubber consumed. This proportion roughly conforms to American experience. The following is an estimate of peak pre-war production at the five major German tire factories:

| | Tire Production per Day (excluding tubes and bicycle tires) |
|---|---|
| Continental (Hanover) | 5000 |
| Metzler (Hamburg) | 2000 |
| Engelbert (Aachen) | 2200 |
| Peter Union (Frankfort) | 1000 |
| Semperit (Vienna) | 500 |
| | 10,700 |

Assuming, as indicated proper by Mr. Marquette, 240 working days per year, annual tire production can be taken at 2,568,000. The average weight for a German tire, under pre-war conditions, was about 60 lbs., of which 40 lbs. was rubber, the remainder fabric and wire. These assumptions yield an annual consumption of rubber in tires of 102,720,000 lbs., or about 47,000 long tons. Since total pre-war rubber consumption was calculated at about 75,000 tons, this figure seems reasonable, if in fact two-thirds of German rubber

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consumption was allotted to tires.

As noted above tire manufacturers were required to produce a Grade A and Grade B product. The former is made from a combination of Buna and natural rubber, with the proportion of the former growing from 25%, at the outbreak of the war to 80 or 100%, by the close of 1940, according to the experience of the Engelbert plant (Aachen). Grade B tires are made of a maximum proportion of reclaim rubber, mixed with natural or Buna, and designed for active service conditions, with a projected life of only 3500 miles. It is stated that vehicles being transferred from the zone of the interior to the theater of operations have Grade A tires replaced with Grade B, the German authorities preferring to supply ample Grade B spares than to destroy "good rubber".

The German tire manufacturing facilities were supplemented, after June 1940, by those of France. Some stocks of crude rubber were left in France to be made into tires for the German account. The Goodrich plant, at Colombes, whose manager DeMeuus was for long closely associated with Continental, is believed to have fully retained its stocks; while the Michelin plant, in August 1941, was reported employing 6-7,000 workers for three days per week.[1] By the close of 1941, however, natural rubber stocks in

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1/ "Summary of Enemy Economic Developments", No. 102, Aug. 27, 1941, #63.

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France had, apparently, been exhausted.[1] Some Buna was supplied from Germany, but it is probable that the production of tires in France has fallen sharply. The American Naval Attache at Vichy reported as early as August 25, 1941, that the Germans were unable to supply trucks manufactured in France for the German army with tires. The great Engelbert plant at Liege, which was capable of turning out 4500 automobile tires daily, was supplied only sufficient rubber to produce 200 tires at the close of 1940. With respect to rubber, therefore, it may be concluded that the German raw material position has not been sufficiently strong to exploit fully the manufacturing facilities at hand; and that, towards the close of 1941, the supply position was probably weakening.

V. Reclaimed Rubber

The process of reclaiming rubber is relatively simple, involving caustic soda vats and the milling in of some whiting or zinc oxide. German reclaim capacity is given as about 35,000 tons, having been expanded from an estimated 12,500 tons in 1934. The Hamburg reclaim plant, finished in 1937, with a capacity of 7,500 tons, and the extended reclaim plant at Hanover (Continental) are both well equipped; the latter was described by an American observer as more efficient than any unit operating in the United States.

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1/ A British report states that on June 1, 1941, the French stocks of natural rubber were down to 4500 tons, or three months supply at the current rate of production. In September stocks were reported exhausted, with negotiations proceeding for some supply of Buna from Germany.

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Mr. Holt, of the Department of Commerce, calculates that within Germany reclaim materials for 35,000 tons of rubber can be gathered annually. So far as civilian sources are concerned, this amount has decreased with the continuance of war-time restrictions; although the military can probably turn back an equivalent amount of scrap. In addition, Germany commands the idle and redundant tires on civilian and military vehicles both in Germany and in occupied areas. In France alone there were roughly 2 million civilian automobiles, carrying possible 160,000 tons of rubber. This source of supply, coupled with all others at German command, almost certainly ensure that the raw materials for reclaimed rubber will not be an important limitation on the German position.

VI. <u>The German Rubber Supply, 1941</u>.

Detailed information, from the British Ministry of Economic Warfare, on German natural rubber imports in 1941, is given in Appendix A of this report. The volume actually received by the Germans from abroad lies somewhere between a lower limit of 24,000 tons, an upper limit of 68,000 tons. The latter figure almost certainly involves considerable double counting; and a reasonable estimate appears to be 35,000 tons. Until June 1941 the Germans used some of the space allotted to them on the Trans-Siberian Railway for Far Eastern rubber, probably from Indo-China.

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Rubber was ranked second only to vegetable oils, on the German priority list, for this route. With the outbreak of the Russian war French vessels from Indo-China were pressed into service, running west to French and African ports. Some rubber is believed to have come east from Indo-China, and been successfully transshipped across the Atlantic, via Bolivia. In all, about 35,000 tons of crude rubber were believed acquired in 1941 from abroad.

Imports variously routed from the Far East are supplemented to a minor extent by rubber produced in French West Africa. In 1941 this amounted to about 2300 tons, of inferior grade. Efforts are now being made by the French administration to increase the collection of the native rubber plants (Funtumia Elastica and some Brazilian Hevea), which constitute the principal sources of supply in that region. A German-inspired mission, headed by a M. Alcan of Paris, visited the Dakar region early in 1941 to investigate the possibilities of increasing the rubber harvest there.

The Western Campaign of May-June 1940 further strengthened the German rubber position. About 25,000 tons of stock (crude and unused manufactured rubber products) were found in France and the Low Countries, of which an important element was made up of inventories of manufactured

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tires. A part of the crude stocks was transferred directly to Germany, a part was left to French factories to manufacture tires on German account. In addition, however, Germany acquired, for her disposal, the total stock of rubber on civilian and military vehicles in the area conquered. It is known that some British military trucks were reconditioned and put to German use; and some captured tanks and artillery were placed in service in the German army. Rubber on the remaining vehicles formed a vast reservoir of scrap and usable tires, some of which are no doubt capable of being transferred directly to German vehicles. Only one estimate of the total rubber booty acquired in the West is available, coming from the German Military Attache in Washington (December 1940), clearly a suspect source. He offered the figure of 225,000 tons for new and used rubber gathered by Germany in the West.

In the closing months of 1941 there was evidence, both from observers and in German economic policy, that the rubber situation was becoming increasingly severe. This situation undoubtedly was induced by the high level of consumption on the eastern front. It seems probable that stocks of crude and reclaimed rubber have been virtually exhausted. Tentative statistical calculations would indicate that Germany in 1942 will be forced to rely largely on

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synthetic production, used tires, and reclaimed rubber, unless Japan succeeds in achieving a commercial junction with some Axis port in the west. As noted above, however, unconfirmed reports indicate the possibility that two further synthetic plants will soon come into operation, bringing the German synthetic production to about 110,000 tons in 1942.

The following represents what appears, on present evidence, the most reasonable estimate of the sources of German rubber supply in 1941:

| | | |
|---|---|---|
| Stocks, Jan. 1, 1941 | 25,000 | (crude and re-reclaimed) |
| Synthetic Production | 60-70,000 | |
| Reclaim | 35-40,000 | |
| Imports (crude) | 35,000 | |
| | 155- 170,000 | |

Using a completely independent set of data, the British Ministry of Economic Warfare has calculated German rubber consumption at ~~about 200,000~~ 213,000 tons in 1941. They would hold that the gap between apparent supply and calculated consumption was filled from the German stock of manufactured, captured, and requisitioned tires.

VII. German Rubber Consumption, 1941

It is estimated that Germany consumed about 60,000 tons of rubber in 1937; 75,000 tons in 1938; and that, at the outbreak of war, she was consuming rubber at a rate of about 90,000 tons per year. Despite the application of the most rigid civilian economies, the rubber demands made

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for the maintenance and enlargement of the German military machine are believed to have raised German consumption to ~~about 200,000~~ 213,000 tons in 1941. Employing the assumption, derived from British experience, that military rubber consumption is 50% greater in active than inactive service, the British Ministry of Economic Warfare estimates German consumption as follows:

| | |
|---|---|
| 1st six months, 1941 | ~~93~~ 92,000 tons |
| 2nd six months, 1941 | 120,000 tons |
| TOTAL | 213,000 tons |

92,000
121,000
213,000

~~A tentative estimate~~ This source would distribute ~~this~~ the total ~~roughly~~ as follows (in tons):

German Army:

| | Consumption in Terms of Crude Rubber | |
|---|---|---|
| | Jan-June 1941 | July-Dec. 1941 |
| For production of new vehicles | 25,000 | 26,000 |
| For maintenance of establishment (272 divisions)* | 30,000 | 52,000 |
| Allowances for: | | |
| Italian and other Axis military consumption | 9,000 | 11,000 |
| German industrial requirements (including commercial transport | 15,000 | 15,000 |
| German Air Force (including A.A. Transport and Balloons) and German Naval requirements | 13,000 | 17,000 |
| | 92,000 | 121,000 |

As noted above, the apparent gap between supply and consumption, independently calculated, is accounted for

1/ See Appendix B for a detailed, but preliminary estimate of German military consumption of rubber. The present BMEW figure of 203,000 tons represents a refinement of the earlier calculations.

* Includes a calculated 40% saving by re-treading worn tires.

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by British analysts by reference to an unmeasured store of manufactured , captured, and requisitioned tires, believed to be at German disposal.

VIII. Economies in Military Use

Germany has apparently maintained an army of some 300 divisions, for six months preponderantly on active service, on somewhere between 155,000 and 213,000 tons of rubber. This has been achieved not only through an almost absolute prohibition of civilian rubber use, but also by an economical allocation of rubber for military uses.

In general, it would appear that the exact function of each item of military equipment has been carefully examined, and rubber allotted only to the extent that it was required to fit the special need. Artillery attached to infantry divisions, for example, is still preponderantly horse-drawn. In consequence, it is believed that metal-rimmed wheels can be effectively used. Other artillery items (e.g., one type of 90 mm. A.T. gun) have single, narrow tires which appear to be solid, whereas the American model is equipped with heavy double balloon tires, under 1941 specifications. Small high pressure tires, economical of rubber, are also widely used. In cases where rapid movement is required, it is clear that the narrow solid tire would not be satisfactory; and in panzer divisions the German rubber allowance appears generous. But with the infantry

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divisions, which form the bulk of the German army, rubber appears to have been carefully limited.

In the case of tanks, the Germans have not used solid rubber treads, but a rubber layer attached to a metal base. In view of the tendency of Buna to heat, under friction, a solid synthetic tread was, in any case, out of the question. One observer reports many German tanks with neither rubber treads nor rubber bogies, using newly designed steel parts.

The following table indicates the weight of rubber on a sample of comparable German and American military vehicles:

Relative Weight of Rubber on German and American Military Vehicles

Note: The weight of rubber for American vehicles is derived from old (1941) specifications, now being revised; the German figures are from the British Ministry of Economic Warfare.

| GERMAN | | AMERICAN | |
|---|---|---|---|
| Vehicle | Rubber (lbs.) | Vehicle | Rubber (lbs.) |
| 10-ton Tank | 418 | 12-ton Tank | 587.5 |
| 30-ton Tank | 680 | 28-ton Tank | 998.0 |
| Medium Truck | 418 | 2½-ton Truck | 587.5 |
| 5 cm. A.T. Gun | 51 | 57 mm. A.T. Gun | 76.0 |
| 9 cm. A.T. Gun | 51 | 90 mm. A.T. Gun | 411.4 |
| 10.5 cm. Field Howitzer | 50 | 105 mm. Howitzer | 86.36 |

IX. The German Rubber Prospect, ~~1942-43~~ 1942

As early as July 15, 1941 the American Military Attache in Berlin offered the opinion that the rubber situation

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in Germany was serious, and causing more concern even than that in petroleum. Unless the Japanese can open a commercial route to an Axis port in the west, it appears likely that the German rubber situation will markedly deteriorate in the course of 1942. It is probable that crude rubber stocks have been exhausted and that Germany must rely upon its synthetic and reclaim production, on imports, and on such stocks of captured and requisitioned tires that can be transferred directly to military vehicles. Under the conditions of active combat which prevailed for the German Army in the latter half of 1941, 120,000 tons of rubber were estimated to have been consumed. If operations on that scale were to continue throughout the greater part of 1942, consumption might reach an even higher figure than the estimated ~~200,000~~ 213,000 for 1941. In view of the forces arrayed against Germany it seems unlikely that a lesser figure will be reached.

To meet its requirements in 1942 Germany can apparently count only upon the following current supplies:

| | |
|---|---|
| synthetic production | 70-110,000[1] |
| reclaim production | 35,000 |
| French African imports | 2,500 |
| | 107,500 - 142,500 |

Hostilities in the Far East, and the entrance of Brazil into the war have shut off the principal routes of natural rubber import used in the latter half of 1941. If

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1. A range is indicated, since authoritative evidence on synthetic plant expansion is not available, and because bombing attacks may seriously affect the output in the course of 1942.

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Japan were successfully to clear the Indian Ocean of Allied naval vessels, and if Germany were to achieve control of a port on the Red Sea or Persian Gulf, the whole German rubber problem would, of course, be easily resolved.

The figure for reclaim production is arbitrarily given at 35,000 tons. If, in fact, Germany were to face a rubber shortage on the scale indicated reclaim capacity would, undoubtedly, be expanded. The tires of unoccupied France, immobilized by a drastic restriction on gasoline, have not yet been turned over to the Germans, for reclaim or for direct use; although the French were forced to register their holdings in September 1941. In addition the Germans have undoubtedly accumulated some considerable rubber supplies from captured Russian vehicles; and if Russian synthetic rubber can be reclaimed, the natural flow of worn rubber from German vehicles has been thus expanded. It seems doubtful, further, if Germany was forced, in 1941, to expend its total supplies of captured and requisitioned tires. Some backlog of scrap rubber must remain. In short, if German and Russian synthetic rubber can be reclaimed, it seems likely that German reclaim capacity can be kept running fully in 1942; and if necessary, reclaim output might be considerably expanded.

It may be concluded, therefore, that barring imports from the Far East and a sharp reduction in German military activity, the German rubber position will deteriorate in 1942. The calculated increment to synthetic production

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is outweighed, on present estimates, by the probable loss of natural rubber imports, the exhaustion of the natural rubber stock-pile and a considerable part of the hoard of captured and requisitioned tires. If this view is correct, intelligence reports should, in the course of 1942, reflect an increased reliance on synthetic rubber, and a general intensification of the German rubber problem.

Appendix A

# AN ESTIMATE OF THE GERMAN RUBBER POSITION, 1939 - 1942

| | 1939 | 1940 | 1941 | 1942 |
|---|---|---|---|---|
| Stocks January 1 | 45,000 | 65,000 plus 25,000 | 25,000 | - |
| Imports | 65,000 | 40,000 | (June) 35,000 | 2,500-35,000 |
| Synthetic Production | 25,000 | 45,000 | 65,000 | 70,000-110,000 |
| Reclaim | 35,000 | 35,000 | 35,000 | 35,000 |
| Total Supply | 170,000 | 210,000 | 160,000 | 107,500-180,000 |
| Total Consumption | 105,000 | 185,000 | 213,000 | 200,000-250,000 |
| Carry-over | 65,000 | 25,000 | * | * |

Note: None of the figures in this table can be regarded as more than roughly accurate. For the sake of clarity, however, only the data for 1942 are presented in the form of ranges. The asterisks (*) indicate calculated deficiencies made up out of a store of captured and requisitioned tires which was ample for 1941 but probably depleted for 1942. The figure for reclaim is given at the fixed capacity figure of 35,000 throughout, although manufacturing facilities may easily be expanded, as noted in the text. The rates of consumption for 1939 and 1940 are calculated so as roughly to take account of two factors: (a) the extent of active military operations in 1939-40, as compared to 1941; and (b) the expansion in the total size of the German military establishment in 1939-40, and consequent increased demand for rubber on new vehicles.

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